Is Ambulatory Blood Pressure Monitoring Finally Catching On?

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Evaluation of blood pressure (BP) using ambulatory BP monitoring (ABPM) may play an important role in predicting cardiovascular (CV) prognosis and is increasingly being used in clinical practice.[1] ABPM may be particularly useful in assessing BP in patients with discrepancies between office and home BP readings in both patients with white coat hypertension and masked hypertension, in patients with labile hypertension to establish nondipper status, in patients with resistant hypertension and episodic hypotension, and to determine BP control in patients taking multiple medications with early morning surges in BP.[2–4] ABPM is considered the gold standard in BP measurement and is also increasingly being used to verify BP in large clinical trials.

ABPM provides information about BP during daily activities and during sleep. Nighttime BP measured by ABPM is superior to office BP measurement in predicting CV events. BP has a reproducible circadian profile with higher values while awake and active and lower values during rest and sleep and an early morning increase for $\geq$3 hours during a transition of sleep to wakefulness. In most people, BP drops by 10% to 20% during the night (nighttime dipping). Those without nighttime dipping appear to be at higher risk of CV disease.[5–7] Recent studies have drawn attention to the potential importance of controlling not only daytime but also nighttime BP. In this regard, control of the early morning surge may prove to be particularly important in preventing stroke.

ABPM is performed by using a device that is easily worn by the patient for 24 to 48 hours, and BP is usually measured every 15 to 20 minutes during the day and every 30 to 60 minutes at night. Patients also record an activity log, which can be correlated with BP changes. These BPs are recorded on the device and the average daytime (awake) or nighttime (sleep) BPs are determined from the data by a computer program. The percentage of BP readings exceeding the upper limit of normal reflects vascular "load" and is considered to provide a more quantifiable measure of systolic and diastolic BP effect than an individual BP measurement. Dipping status is determined by a 10% fall in systolic and diastolic BP comparing daytime with nighttime (and nap time) readings.

The diagnosis of hypertension using ABPM depends on the time span over which it is interpreted. The following readings are defined as hypertension on ABPM: a 24-hour average BP >135/85 mm Hg, a daytime (awake) average BP >140/90 mm Hg, and a nighttime (asleep) average BP >125/75 mm Hg.

ABPM continues to sharpen the relationship between BP profile and CV risk, and this is demonstrated in a report from the International Database of Ambulatory Blood Pressure Monitoring in Relation to Cardiovascular Outcomes (IDACO). This report provides some useful "side by side" comparisons of ambulatory BP measurements and office BP

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Table. Proposal for Outcome-Driven Reference Values for Ambulatory Blood Pressure Measurement

	24-Hour	Daytime	Nighttime
Optimal blood pressure, mm Hg	<115/75	<120/80	<100/65
Normal blood pressure, mm Hg	<125/75	<130/85	<110/70
Ambulatory hypertension, mm Hg	≥130/80	≥140/85	≥120/70

in assessing the 10-year risk of CV disease.[8] The study involved a total of 7609 people from Europe. Some patients had no nighttime readings or other problems with the office or ambulatory BP measurements, leaving a total of 5682 patients for analysis. The goal was to determine the ABPM thresholds that yielded 10-year CV risks similar to those associated with optimal (120/80 mm Hg), normal (130/85 mm Hg), and high (140/90 mm Hg) BP on office measurement. In the course of follow-up (9.7 years on average), there were 814 CV end points. The investigators determined that the optimal 24-hour averaged ambulatory BP profile was a value of <117/84 mm Hg. This broke down into values of 122/79 mm Hg for daytime and 101/65 mm Hg values for nighttime readings. The Table represents the rounded values (to the nearest 0 or 5) of ABPM from their study that correspond to the office-based reference ranges for optimal, normal, and high (ambulatory hypertension) values cited above. The populations in the countries of origin of this international database likely include few black patients. In addition, the study mixed patients on hypertension treatment with all the others. Nonetheless, these results based on CV outcomes reemphasize the lower ABPM values compared with office BP profiles and provide data that could be used to develop a testable framework for intervention (initiating or titrating BP medication) based on an ABPM strategy.

Despite the established value of ABPM it is still unavailable to many clinicians' practices. This is due to a combination of factors, including lack of knowledge regarding its utility, lack of expertise in interpreting the information, expense of purchasing the devices, and most importantly minimal reimbursement by third-party payers.[9] In addition, ABPM is still only a one-time measure of a variable factor that must be followed over time. Two other aspects derived from ABPM are worthy of update, namely white coat and masked hypertension, which we hope to address in future columns.

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